

WA Commercial Building Energy Performance Standards – Draft EUI Means

May 21, 2020

Presented at: webinar

Prepared by: **SBW Consulting Team**



Agenda:

- Review EUI Target Development Process & Timeline
- Recap EUI Mean Analysis Methodology
- Draft EUI Means
- Next Steps: Targets and Reporting

EUI Target Development Process

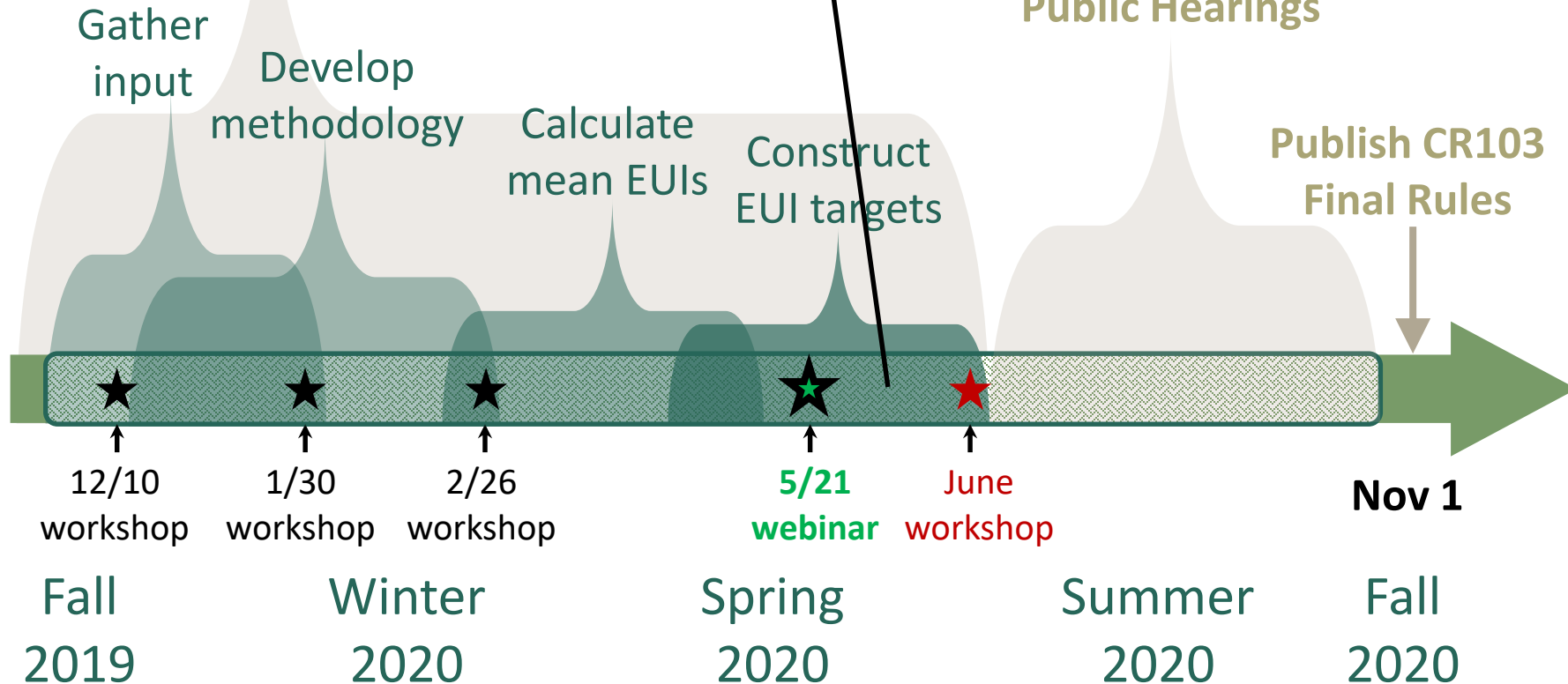
CR101 Pre-rulemaking

Comments due
June 4, 2020

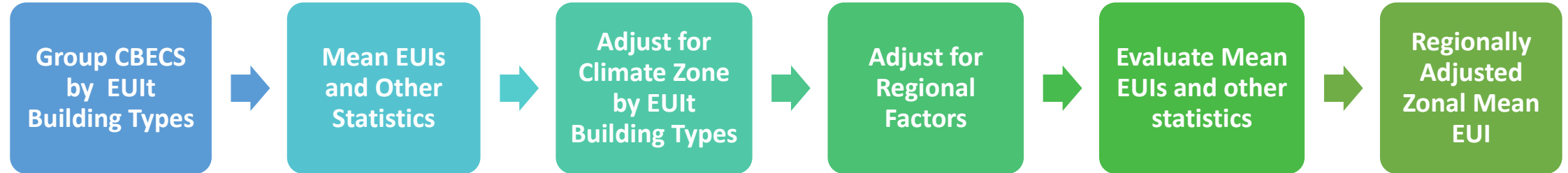
CR102 Rulemaking

Public Hearings

Publish CR103
Final Rules



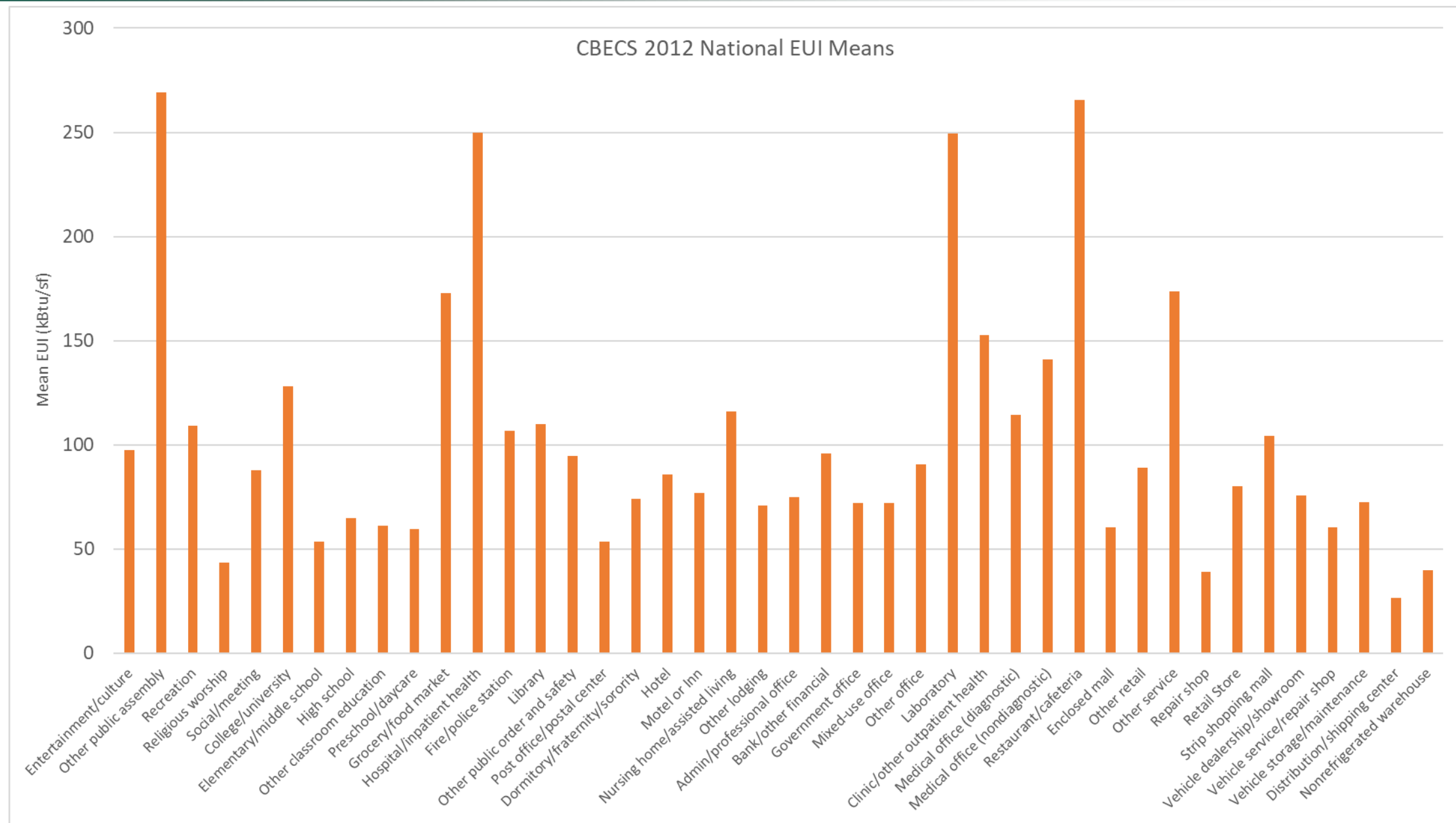
Mean EUI Development Overview





Assemble CBECS Mean EUIs for EUI_t Building Types

- Group CBECS data by ASHRAE 100 **EUI_t building types**
- Find the statistical characteristics for each group
 - Mean EUI, Population, Standard error, etc.
 - Statistics form the basis for evaluating additional adjustments



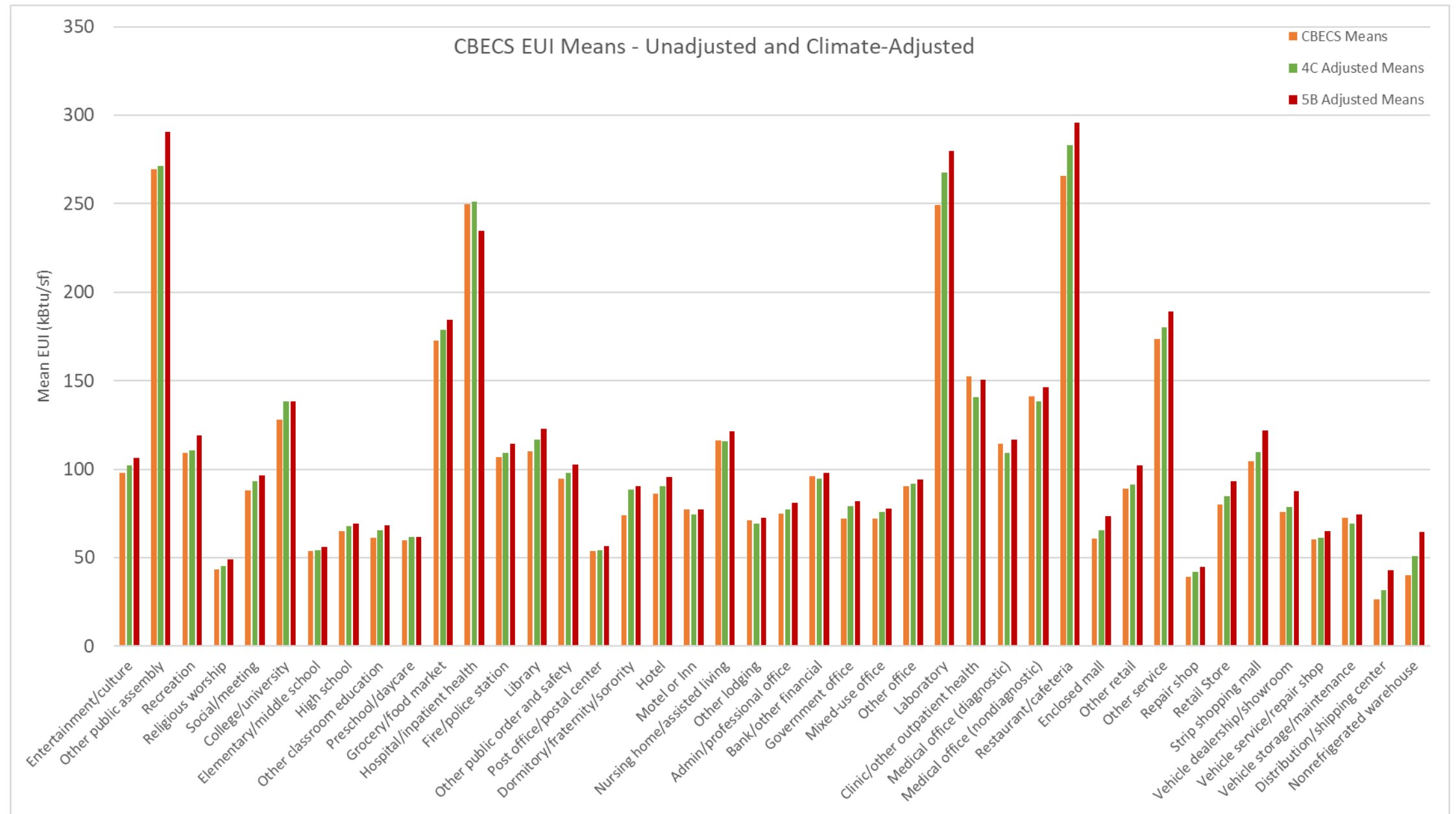
Make Climate Adjustments to Derive Zonal CBECS Mean EUIs

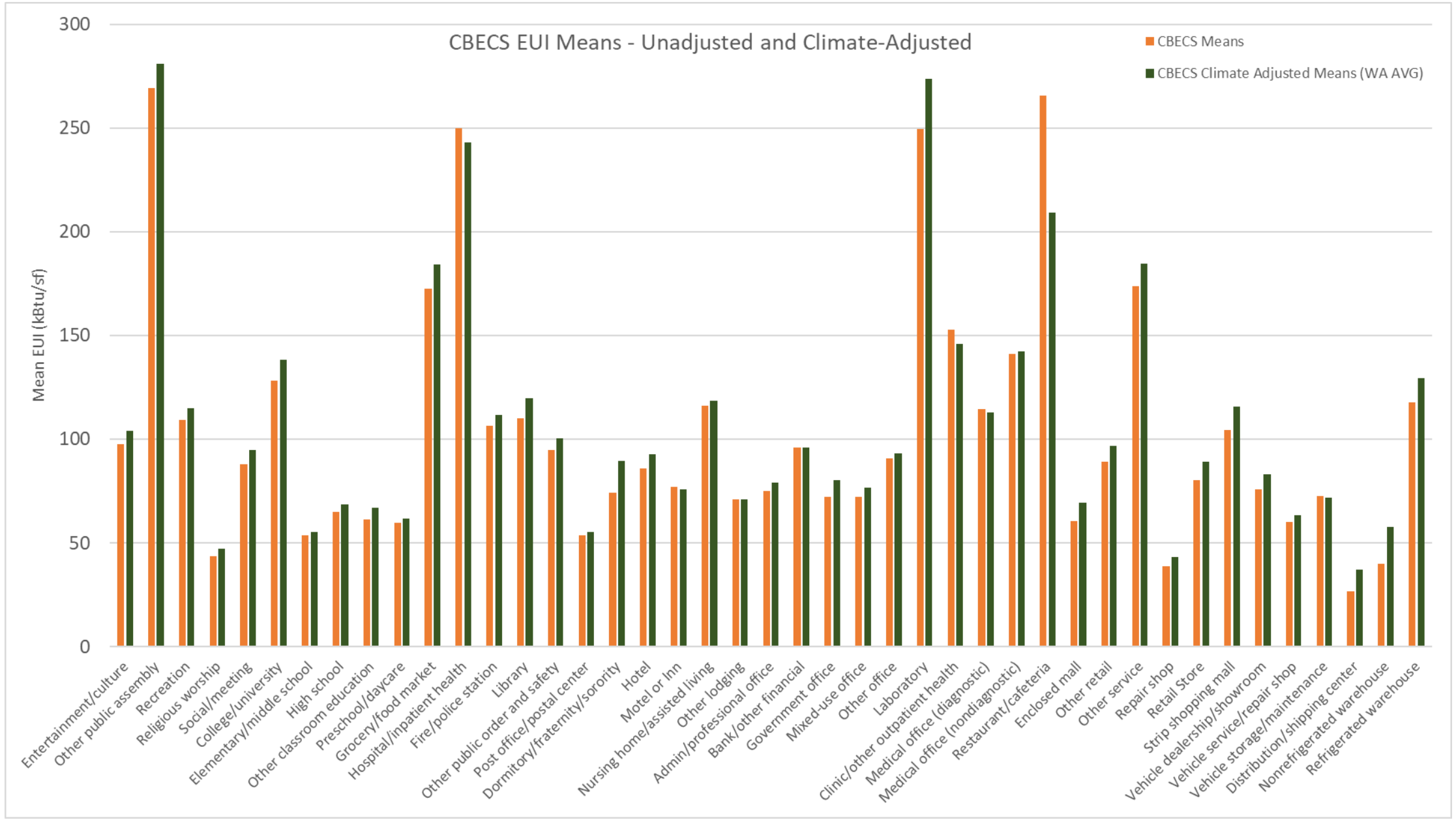
- ASHRAE climate zone factors
 - Select ratios for each of the EUI building types to adjust for WA climates
- Apply climate zone factors
 - Apply factors to 2012 CBECS Mean EUIs for each EUI building type

Table J-1 Ratios of Climate Zonal EUI to Average of All EUIs by Building Type

ASHRAE Climate Zone:	1A	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	6A	6B	7	8
Building Type	Climate Zone EUI Ratio															
All Office	0.91	0.94	0.91	0.97	0.76	0.90	0.78	1.06	0.92	0.94	1.12	0.97	1.25	1.10	1.35	1.89
Large Office	0.88	0.95	0.88	0.98	0.80	0.89	0.81	1.07	0.88	0.98	1.07	0.91	1.15	1.01	1.21	1.63
Medium Office	0.98	0.97	0.98	0.97	0.78	0.93	0.77	1.05	0.91	0.93	1.11	0.96	1.24	1.09	1.33	1.86
Small Office	0.87	0.90	0.89	0.95	0.71	0.89	0.75	1.06	0.96	0.91	1.19	1.06	1.36	1.21	1.50	2.17
Warehouse	0.52	0.66	0.69	0.84	0.45	0.75	0.61	1.13	0.95	0.92	1.50	1.26	2.07	1.70	2.53	4.75
Stand-alone Retail	0.85	0.87	0.85	0.91	0.65	0.83	0.73	1.03	0.90	0.90	1.17	1.01	1.35	1.20	1.50	2.16
Strip Mall	0.89	0.89	0.87	0.94	0.69	0.86	0.77	1.08	0.94	0.96	1.24	1.06	1.43	1.27	1.60	2.29
Primary School	0.98	0.97	0.93	0.97	0.79	0.90	0.83	1.06	0.93	0.94	1.10	0.96	1.20	1.06	1.27	1.87
Secondary School	0.91	0.90	0.89	0.92	0.66	0.86	0.74	1.06	0.88	0.95	1.15	0.96	1.33	1.14	1.46	2.16
Supermarket	0.83	0.90	0.84	0.94	0.78	0.86	0.87	1.02	0.92	0.97	1.10	1.00	1.19	1.10	1.29	1.62
Fast Food	0.89	0.91	0.90	0.95	0.81	0.91	0.86	1.04	0.96	0.97	1.13	1.03	1.24	1.14	1.34	1.70
Restaurant	0.88	0.91	0.88	0.94	0.79	0.89	0.86	1.04	0.95	0.97	1.12	1.02	1.22	1.13	1.33	1.68
Hospital	1.02	1.03	1.00	1.01	0.96	0.99	0.94	1.03	0.92	0.97	1.00	0.91	1.02	0.94	1.03	1.19
Outpatient health care	1.08	1.04	1.05	1.03	0.97	1.03	0.86	1.02	0.98	0.91	0.98	0.96	1.00	0.97	0.99	1.12
Motel	1.07	1.01	1.01	0.98	0.92	0.97	0.90	1.00	0.96	0.92	1.02	0.97	1.08	1.01	1.10	1.32
Hotel	0.93	0.96	0.91	0.97	0.88	0.92	0.91	1.03	0.98	0.99	1.08	1.03	1.15	1.11	1.22	1.41
Mid-Rise Apartment	0.78	0.82	0.82	0.92	0.61	0.84	0.78	1.12	0.93	1.04	1.27	1.07	1.45	1.28	1.65	2.30

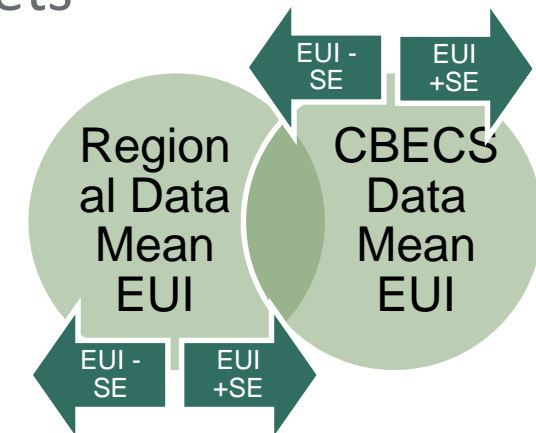
Note: The "All Office" category was calculated from the large, medium, and small office numbers.

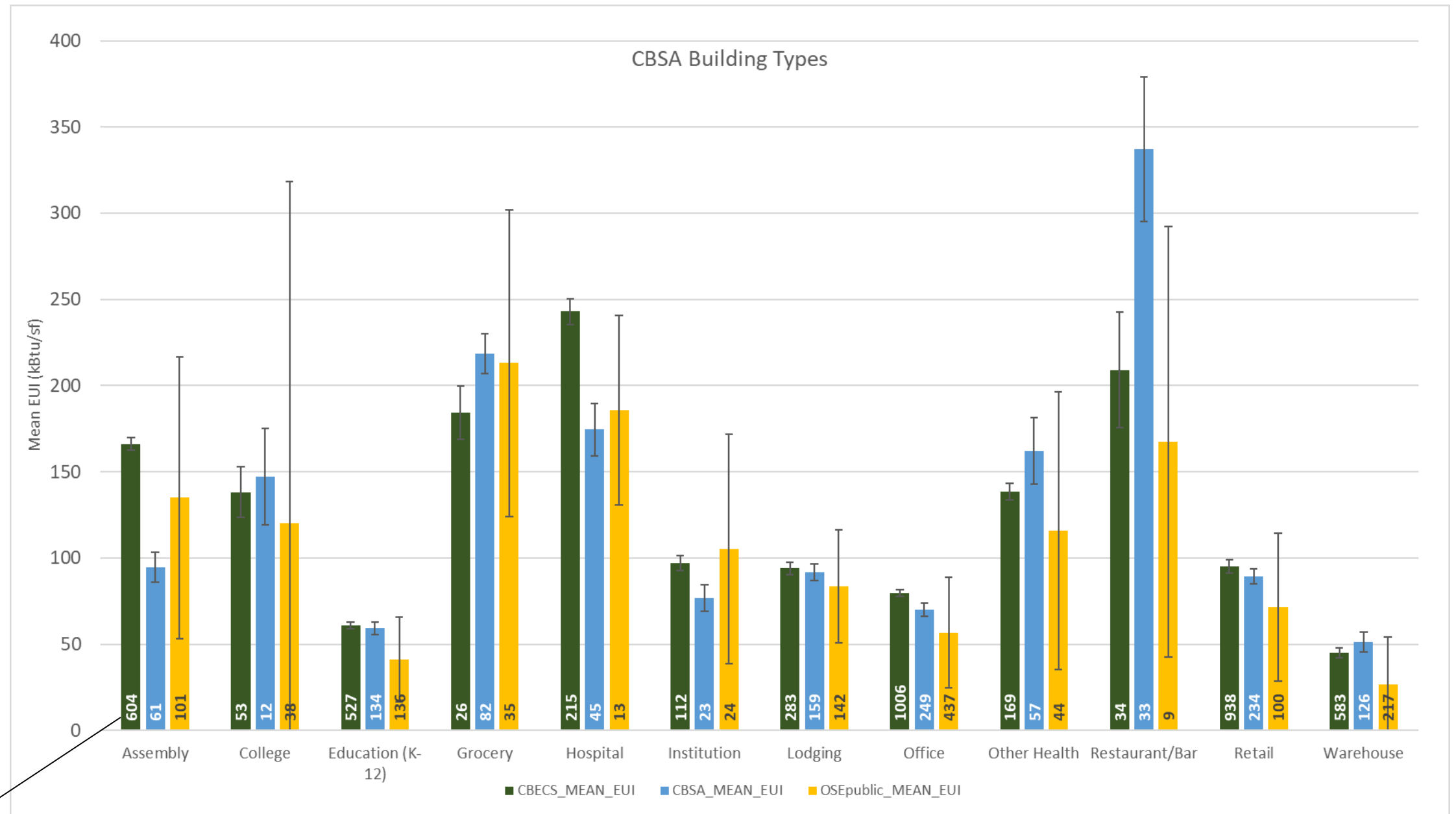


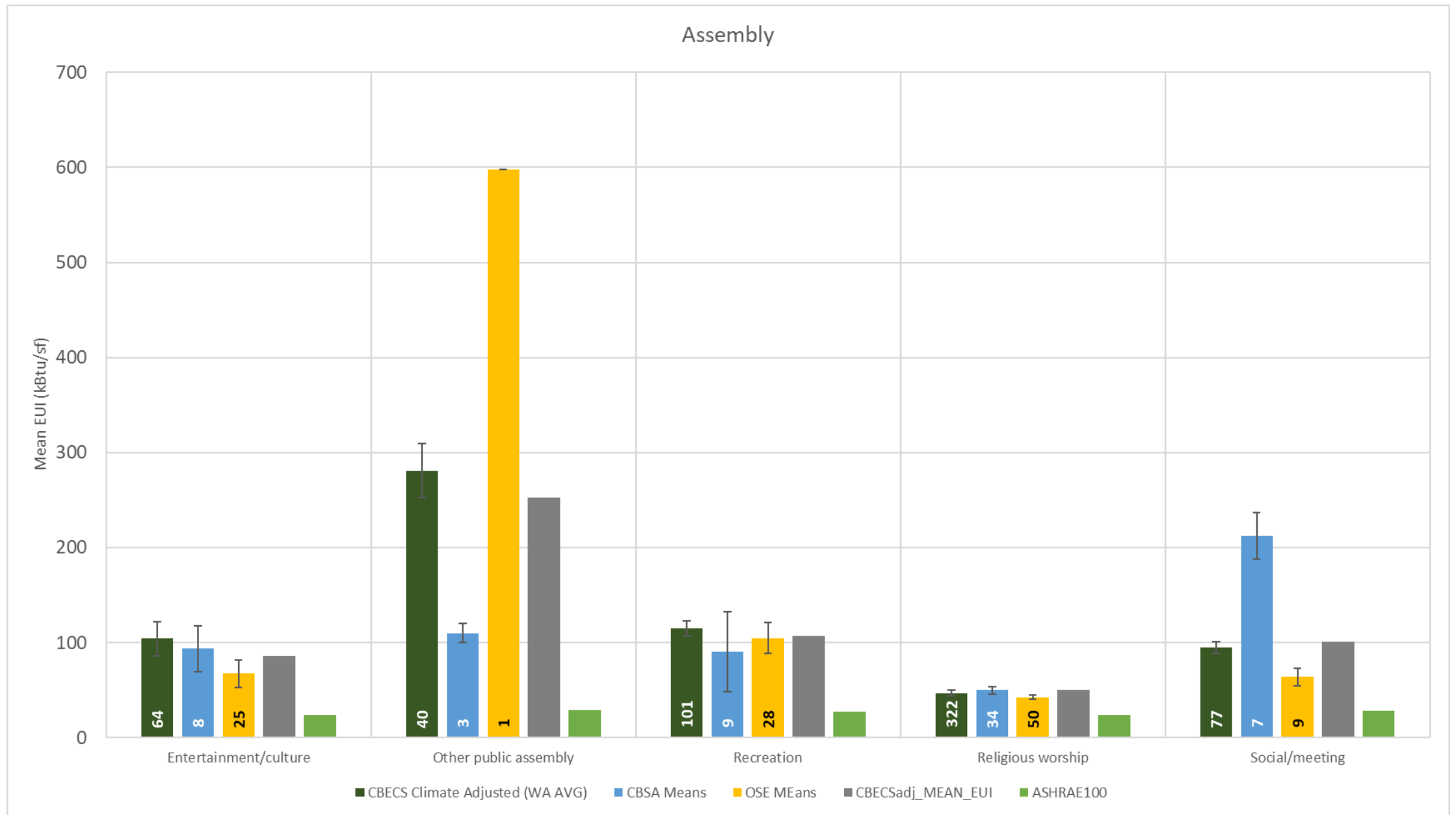


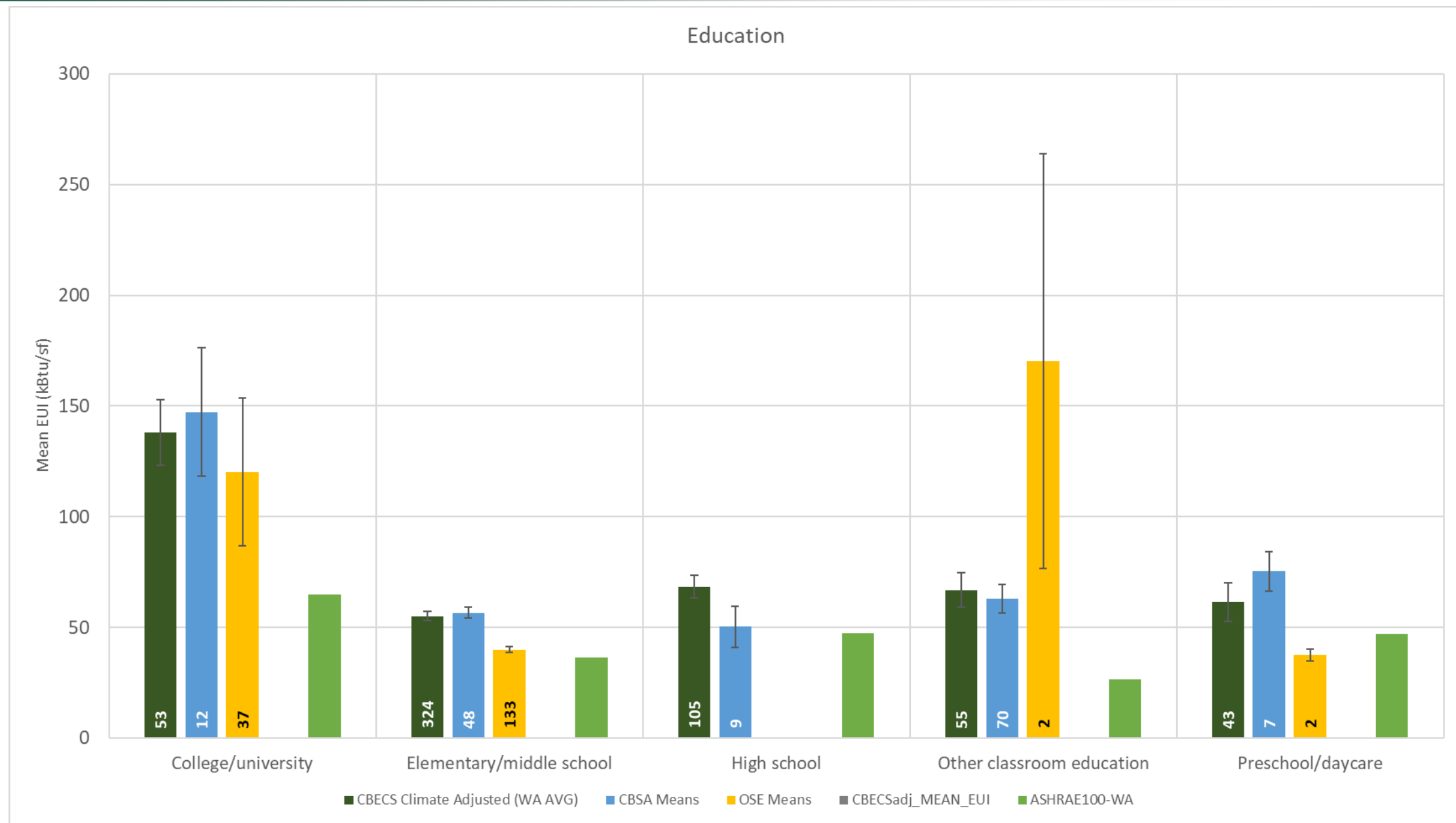
Develop Regionally-Adjusted CBECS Mean EUIs

- For comparing with regional datasets, aggregate CBECS zonal mean EUIs to regional building categories
 - Regional datasets are limited to approx. 13 building categories
- Compare CBECS zonal mean EUIs to mean EUIs from other data sets
 - CBSA, Seattle Benchmarking, and others
 - Find statistical characteristics for each data set
 - Do mean EUIs have comparable statistical results (± 1 SE)?
 - Do the variances overlap the means?
- Adjust CBECS means toward regional means when there is no overlap

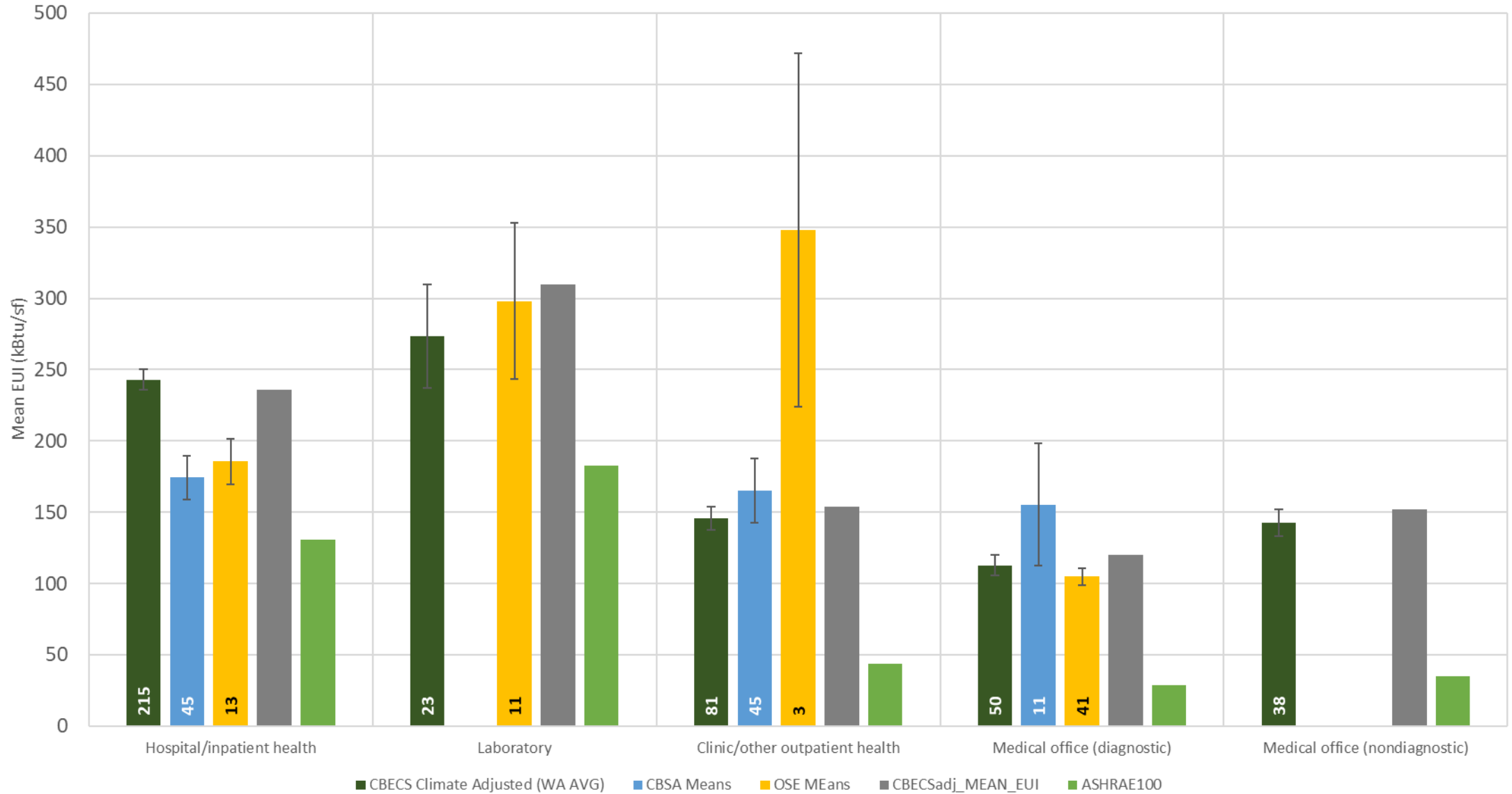


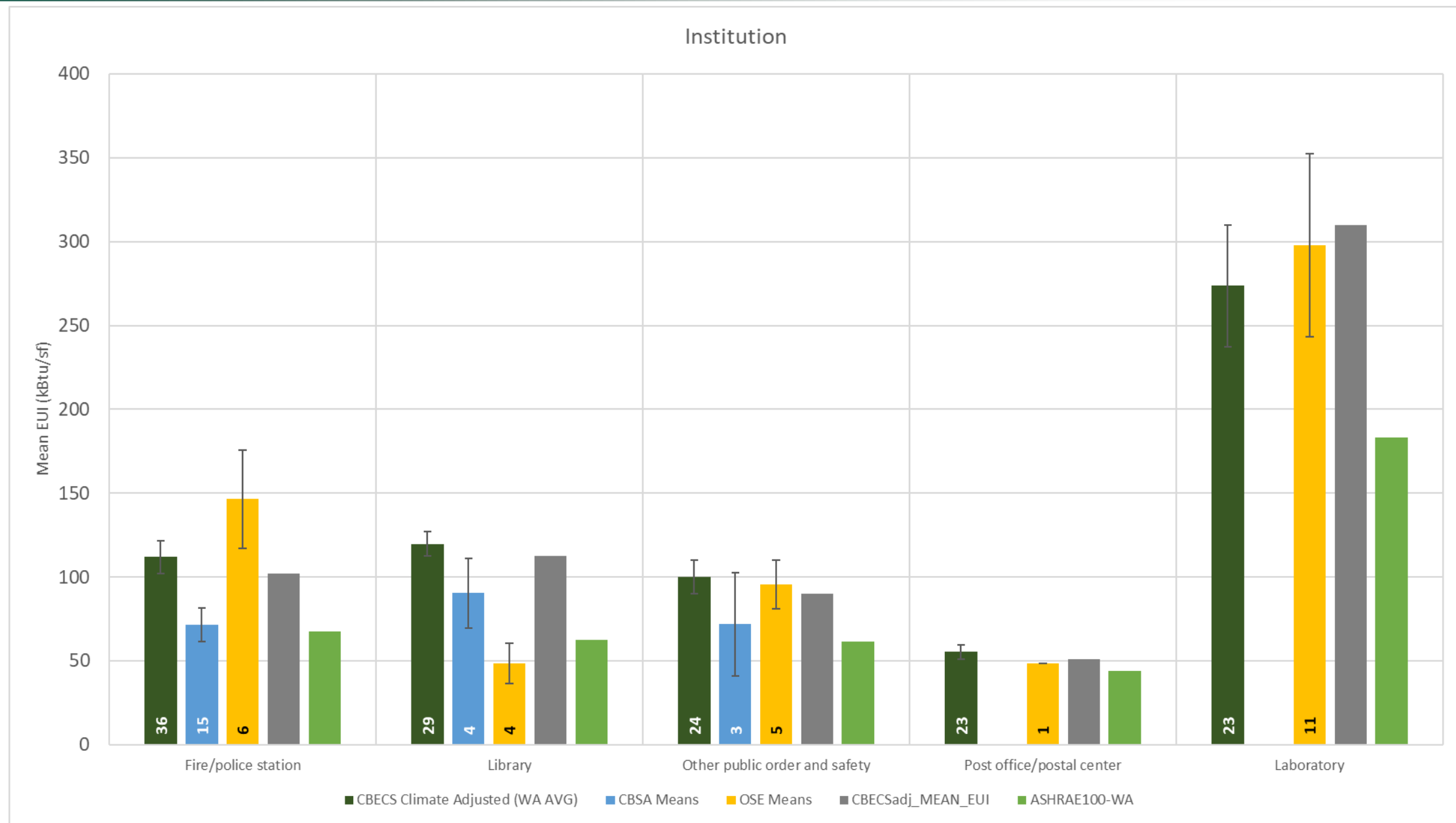


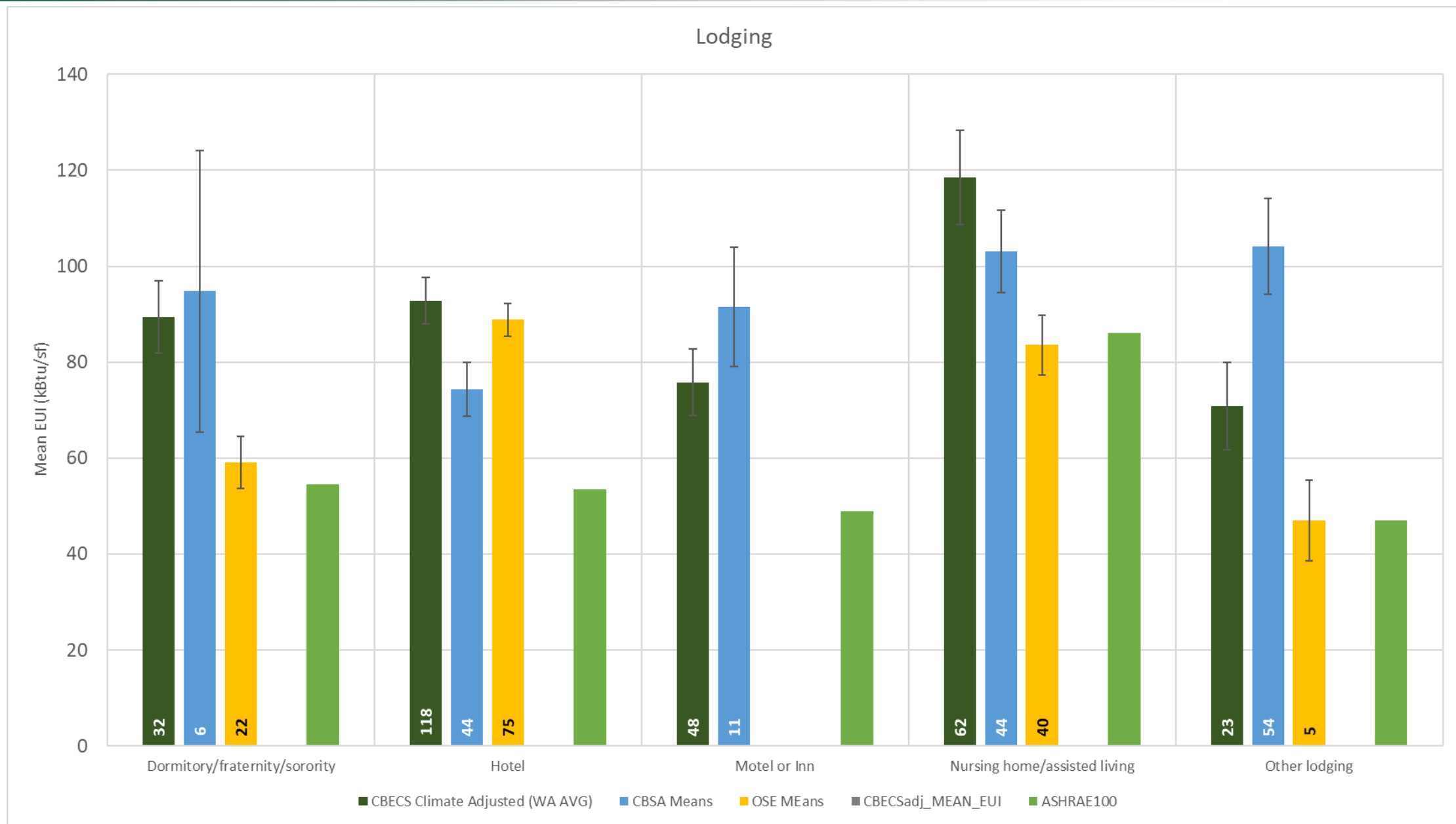


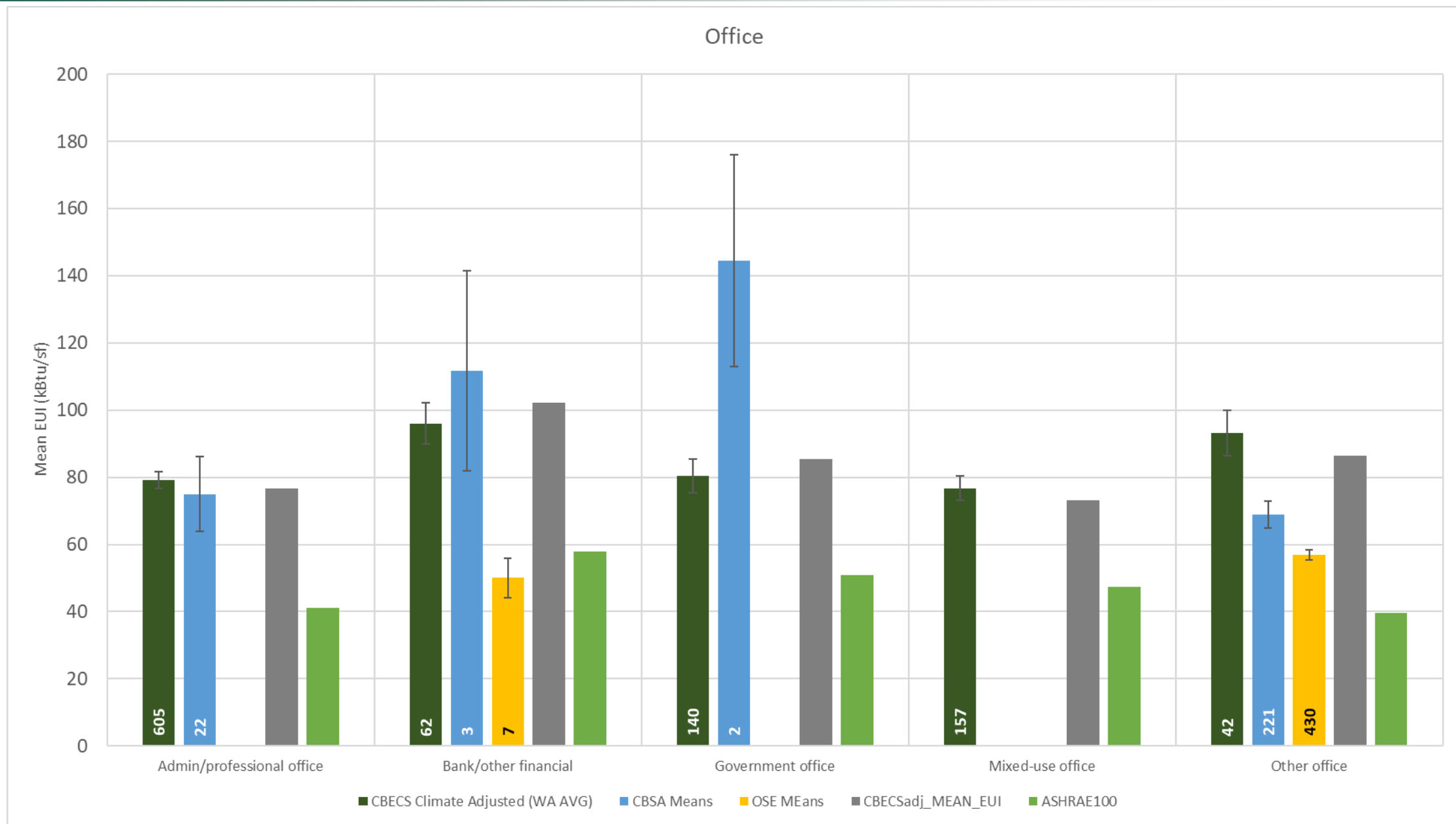


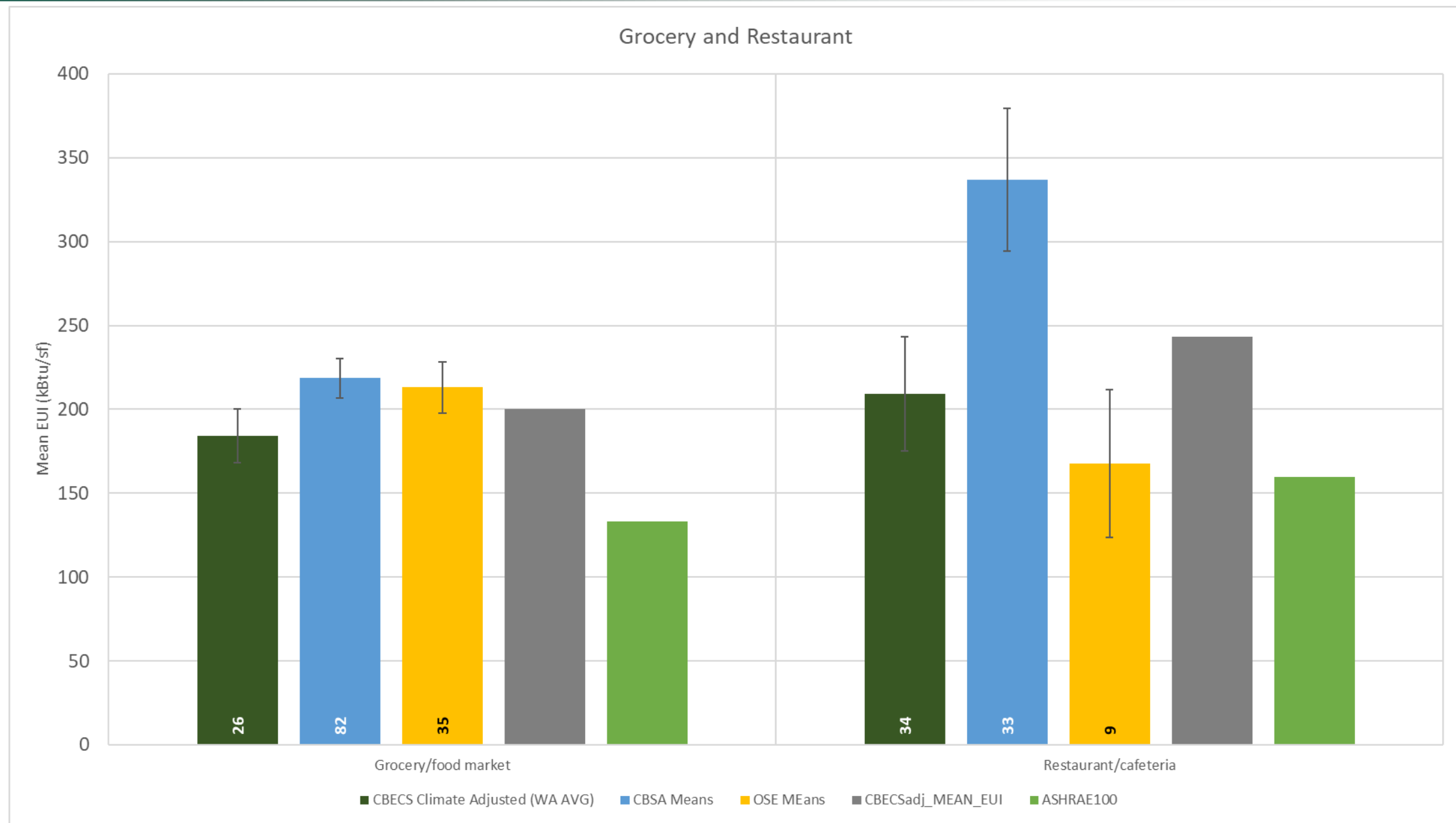
Hospitals and Healthcare

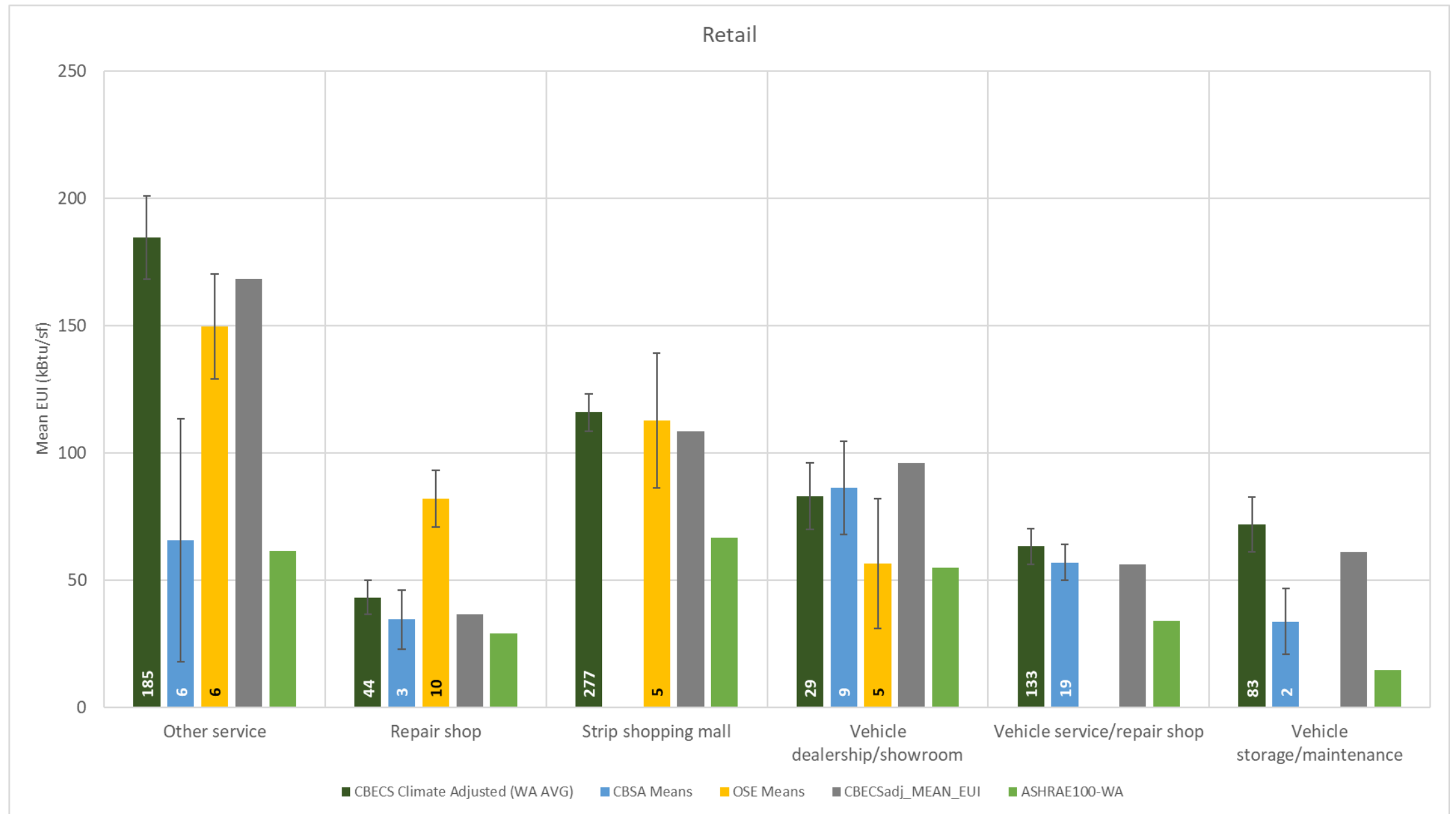


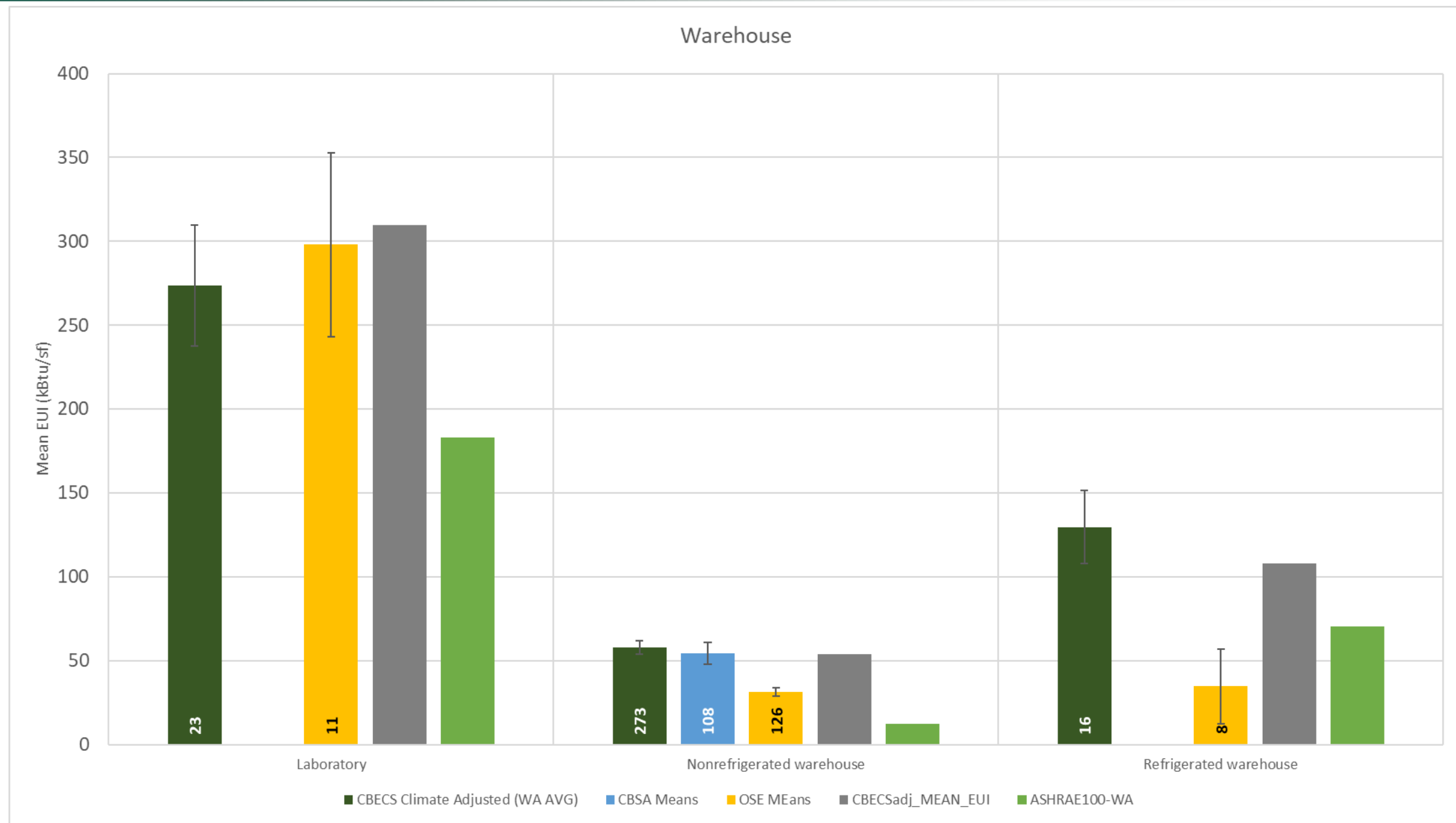


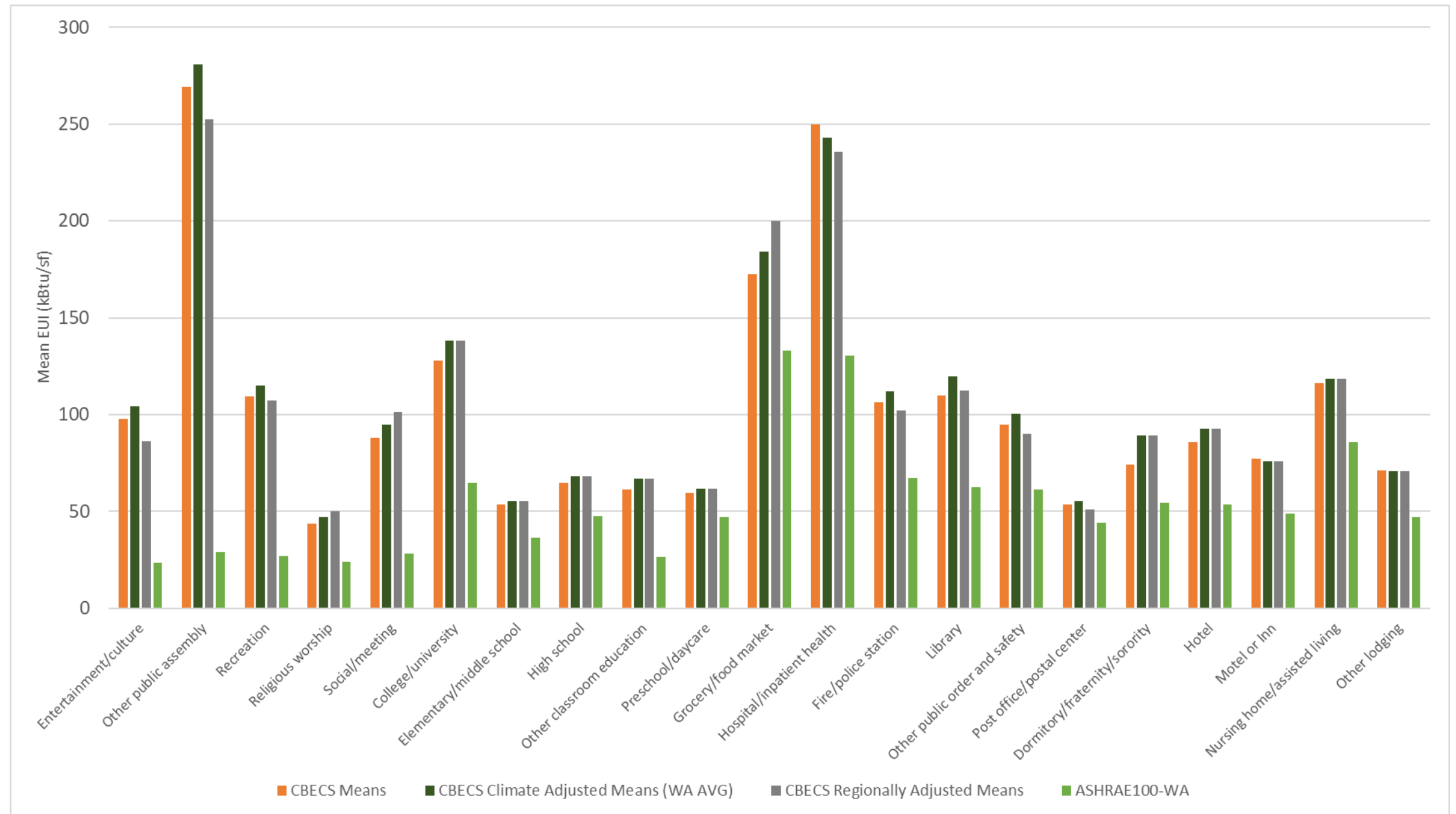


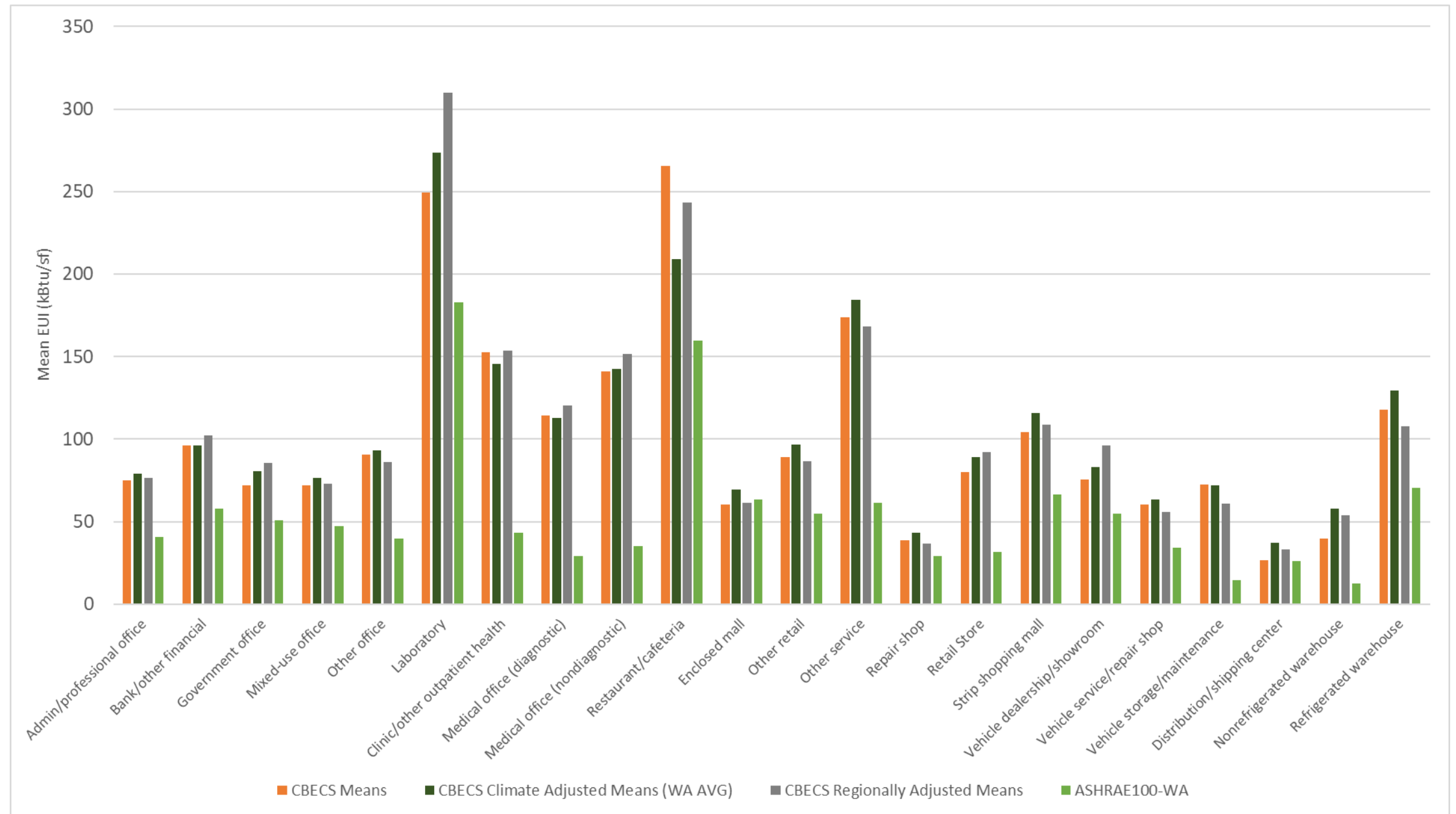












EUI Means by ASHRAE 100 Building Type

ASHRAE 100 Building Type	RAZ Mean EUI	
	WA	ASHRAE 100
Entertainment/culture	86	24
Other public assembly	252	29
Recreation	107	27
Religious worship	50	24
Social/meeting	101	29
College/university	138	65
Elementary/middle school	55	37
High school	68	48
Other classroom education	67	27
Preschool/daycare	62	47
Grocery/food market	200	133
Hospital/inpatient health	236	131

ASHRAE 100 Building Type	RAZ Mean EUI	
	WA	ASHRAE 100
Fire/police station	102	68
Library	113	63
Other public order and safety	90	62
Post office/postal center	51	44
Dormitory/fraternity/sorority	89	55
Hotel	93	54
Motel or Inn	76	49
Nursing home/assisted living	119	86
Other lodging	71	47
Admin/professional office	77	41
Bank/other financial	102	58
Government office	85	51

EUI Means by ASHRAE 100 Building Type

ASHRAE 100 Building Type	RAZ Mean EUI	
	WA	ASHRAE 100
Mixed-use office	73	48
Other office	86	40
Laboratory	310	183
Clinic/other outpatient health	154	44
Medical office (diagnostic)	120	29
Medical office (nondiagnostic)	152	35
Restaurant/cafeteria	243	160
Enclosed mall	61	64
Other retail	87	55
Other service	168	62
Repair shop	37	29
Retail Store	92	32

ASHRAE 100 Building Type	RAZ Mean EUI	
	WA	ASHRAE 100
Strip shopping mall	109	67
Vehicle dealership/showroom	96	55
Vehicle service/repair shop	56	34
Vehicle storage/maintenance	61	15
Distribution/shipping center	33	26
Nonrefrigerated warehouse	54	13
Refrigerated warehouse	108	71



NEXT STEPS: TARGETS & REPORTING



Next Steps: Targets & Reporting

- June: present draft targets to Commerce and the public
- Revise targets based on input
- Draft a report, including:
 - Methodology
 - Key findings
 - Final EUI targets for CR102
 - High-level recommendations/input for market capacity building and ancillary programs and policies

EUI Target Development Process

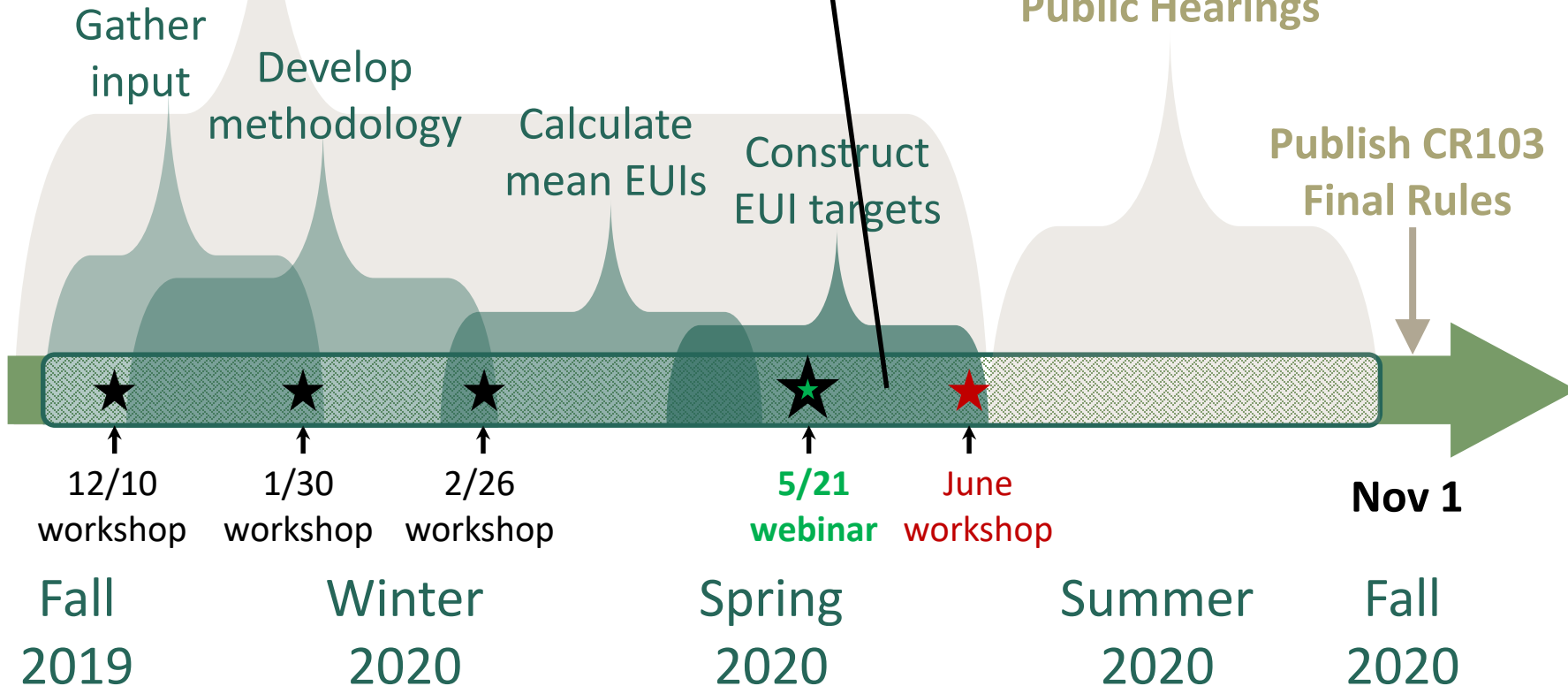
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Final Rules





THE END